REMARKS

Claims 11-24 are pending. Claims 1-10 were canceled. Claims 11, 12, 15 and 18-22 were amended to improve their form. Withdrawal of the outstanding rejections and objections is respectfully requested for at least the reasons set forth below.

Drawings objection

Claim 11 was amended to delete the specific types of implanted ions, and thus the drawing objection is believed to be moot. However, to fully address the objection, Fig. 1B was amended to explicitly label element 108 as being "inert gas ions." Therefore, Fig. 1B shows the claimed step of "implanting ions of an inert gas...". Support for this drawing amendment is described, in part, on page 6, lines 1-3.

Specification objection

This objection is believed to be moot in view of the cancellation of the objected to phrase from claim 11. The new phrase, "implanting ions of an inert gas into the implanted silicon layer to create a strain between particles of the silicon layer and the implanted ions of an inert gas" is fully supported by at least page 4, lines 2-3 and page 6, lines 1-3 and 10-13 of the specification.

Claim Objections

This objection is believed to be moot in view of the cancellation of the objected to phrases from claims 11, 19 and 22.

Rejection under 35 U.S.C. § 102(b)

Claims 11, 13, 14, 18, 19 and 22 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 6,159,810 (Yang), hereafter, "Yang." Claims 12, 15-17, 20,

21, 23 and 24 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Yang. Applicant respectfully traverses these rejections as they relate to amended claims 11-24.

1. Patentability of claim 11 over Yang

Amended claim 11, recites, in part,

> implanting ions of an inert gas into the silicon layer to create a strain between particles of the silicon layer and the implanted ions of an inert gas;
>
> implanting boron ions into the silicon material layer to form an implanted silicon layer;
>
> patterning the implanted silicon layer and the layer of gate oxide;

a. In one preferred embodiment of the present invention recited in claim 11, impurities (i.e., the implanted ions of an inert gas) are introduced before boron implanting. Then, after the boron implanting, patterning is completed to form the gate structures. See, page 6, lines 1-9 and lines 16-21 of the present application which reads as follows (underlining added for emphasis):

> [014] Referring to FIG. 1B, a first ion implantation process follows by doping layer 106 with a first dopant 108. Dopant 108 may be ions selected from one of the inert gases helium (He), neon (Ne), krypton (Kr), or xenon (Xe). The first implantation is performed with a doping density of at least 10^{13} ions/cm^2 and at energy of less than 100 KeV. Referring to FIG. 1C, a second ion implantation follows, in which first-doped layer 106a is further implanted with boron (B) or boron difluoride (BF_2) ions 110 to form a conductive layer 106a. The boron (B) or boron difluoride (BF_2) implantation is performed with a doping density of at least 10^{13} ions/cm^2 and at energy of less than approximately 80 KeV.
>
> [016] Referring to FIG. 1D, layer 106b and gate oxide layer 104 are patterned and etched to form a plurality of gate structures (not numbered) with conventional processes. The plurality of gate structures are insulated by isolation regions 102. Thereafter, an annealing step is performed to activate the implanted boron (B) or boron difluoride (BF_2) ions in the implanted region 106b. Finally, source and drain regions 112 and 114 are formed in substrate 100.

In summary, the above-highlighted steps occur in the following order:

1. implanting impurities of an inert gas first,

2. implanting boron ions, and

3. patterning the implanted silicon layer.

In contrast to claim 11, Yang introduces impurities (i.e., the implanted ions of an inert gas) before gate electrode pattern and then boron implanting is completed after gate electrode pattern, as described in the following text portions of Yang (underlining added for emphasis):

> Referring now to FIG. 4, an amorphous impurity layer 17 is formed on the polysilicon layer 15. The amorphous layer 17 can allow an amorphous silicon layer to be formed thereon subsequently, as will be described below. (column 5, lines 32-35)
>
> The amorphous impurity layer 17 may be formed using plasma processing, ion implantation and/or other techniques. To form the amorphous impurity layer 17 by plasma processing, the substrate 11 is inserted into a plasma processing chamber. A plasma, preferably of an inert element such as argon, xenon, helium or krypton, preferably penetrates into the surface of the polysilicon layer 15, to thereby form the amorphous impurity layer 17. (column 5, lines 36-43)
>
> Then, the amorphous silicon layer 19, the amorphous impurity layer 17 and the polysilicon layer 15 are patterned using conventional photolithography to form the gate electrode pattern of FIG. 2. (column 5, lines 55-58)

The above excerpt of Yang discloses that the impurities of an inert gas is the first step and patterning to form the gate electrode is the second step. In contrast, the preferred embodiment of the present invention implants boron ions as the second step.

b. Amended claim 11 further recites that the patterning step occurs after the boron implantation. (This is inherent in claim 11 because the patterning relates to the silicon layer.)

In contrast to amended claim 11, Yang performs patterning before any boron implantation, as described in the following text portions of Yang (underlining added for emphasis):

> After formation of the gate electrode 201, additional doping of the polysilicon gate electrodes 201 with n-type or p-type impurity to control resistivity may be performed if necessary. (column 6, lines11-14)

Yang describes using boron for providing the p-type impurity. See, column 5, lines 25-27 and column 7, lines 26-27.

Thus, in Yang, ions of an inert gas are implanted on a polysilicon layer, and boron is implanted only later in the process after the gate electrode pattern.

c. Claim 11 further recites "activating the implanted boron ions." On page 6, line 8 of the Office Action, the Examiner asserts that Yang discloses this step, but no portion of Yang is highlighted as disclosing this feature. Applicants have carefully read Yang and cannot identify any such step.

In view of the opposite order of claimed steps and the absence of at least one of the steps, Yang cannot anticipate amended claim 11. Claim 11 is thus believed to be patentable over Yang.

2. Patentability of claim 18 over Yang

Claim 18 also recites that the patterning step occurs after the boron implantation. As discussed above in section 1b, Yang discloses that these steps occur in the opposite order.

Claim 18 further recites "annealing at least the layer of semiconducting material." As disclosed in the specification, the annealing activates the implanted boron. The Examiner's Office Action did not highlight where this step occurs in Yang. Applicants have carefully read Yang and cannot identify any such step.

For at least these two reasons, claim 18 is also believed to be patentable over Yang.

3. Patentability of dependent claims

The dependent claims are believed to be patentable because they depend from allowable independent claims and because they recite additional patentable features. Therefore, Yang does not make up for the above-noted deficiencies.

Conclusion

Insofar as the Examiner's rejections were fully addressed, the instant application is in condition for allowance. A Notice of Allowability of all pending claims is therefore earnestly solicited.

Respectfully submitted,

Tzu Yu Wang

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(Date)

CLARK A. JABLON
Registration No. 35,039
AKIN GUMP STRAUSS HAUER & FELD LLP
One Commerce Square
2005 Market Street - Suite 2200
Philadelphia, PA 19103
Direct Dial: (215) 965-1293
Facsimile: (215) 965-1210

CAJ:PAI

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Amendments to the Drawings:

In Fig. 1B, add a label "inert gas ions" to element 108.

A Replacement Sheet is attached hereto.